Alfvénic Density Holes and Ionospheric Upwelling

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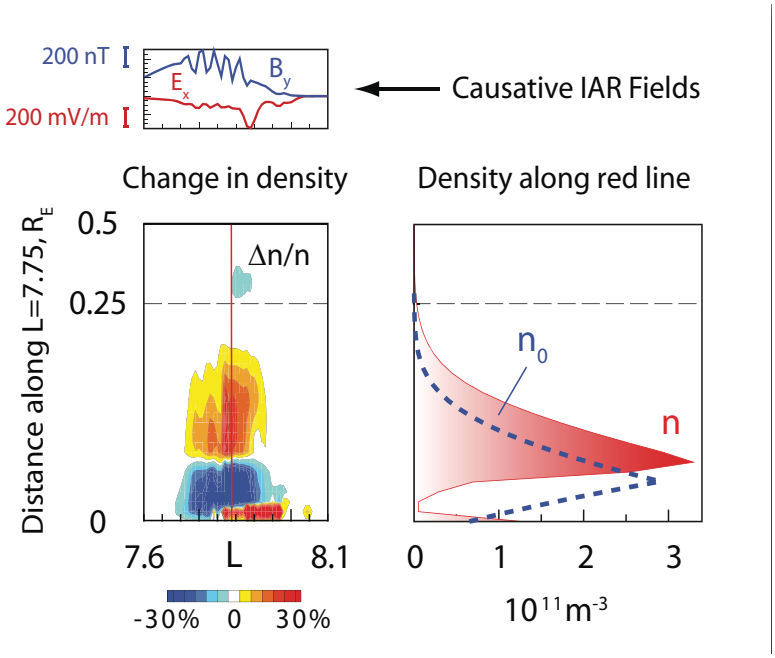
The Ionospheric Alfvén Resonator (IAR) is an electromagnetic cavity bounded by the conducting ionosphere from below and by a steep gradient in the Alfvén-wave refractive index near 1 R_E altitude. It is known from previous studies that a resonant feedback instability amplifies spontaneously generated IAR oscillations in regions where downward currents flow between the magnetosphere and ionosphere. The ensuing turbulence is commonly observed by polar-orbiting satellites, like FAST and Dynamics Explorer. More recent studies sponsored by the Heliophysics Theory Program predict that the ponderomotive force of the small-scale IAR oscillations transports ionospheric plasma upward, creating a large-scale, bottomside density cavity. The upwelled plasma enhances the topside source of outflowing heavy ions that circulate through the plasmasheet and intensify the stormtime ring current. Multiscale interactivity of the magnetosphere-ionosphere system is clearly evident in this process.



Ionospheric plasma redistribution, cavitation and upwelling produced by feedback-unstable ionospheric Alfven Resonator Oscillations.

Reference: Streltsov, A.V. and W. Lotko (2008), Coupling between density structures, electromagnetic waves and ionospheric feedback in the auroral zone, *J. Geophys. Res. 113*(A05212), doi:10.1029/2007JA012594.